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# Ramp events in the marine boundary-layer investigated by a wind lidar.

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Wind-energy operators tend to replace tall-mast measurements with wind lidars due to higher resolution and reach of measurements, as well as lower costs. The quality of the individual wind-lidar observations is described by the so-called Carrier to Noise Ratio (CNR). Applying filter of CNR>-22 dB is usual practice, but we have demonstrated in earlier studies that such filtering of the wind-lidar observations affects the climatological long-term wind speed in such a way that when a low CNR threshold value is applied (e. g. -22 dB) the mean wind speed is overestimated.

The cumulative probability of wind-speed and wind–direction ramps on time scales from 10-min to 24 hours is discussed, based on one year of offshore wind-lidar measurements, carried out in 2013/2014 at the German Research platform Fino3 in the North Sea. The ramp events are compared to WRF model simulations. It can be seen that WRF under-predicts ramp events in the wind speed for the entire cumulative wind speed distribution and for all the investigated timescales.

A similar analysis was carried out for wind directional changes. Here it was found that WRF underestimated the wind directional ramp for small time scales and increasing well predicted the cumulative distribution of the wind directional ramps with increasing time-scale. An explanation might be that because WRF does not predict the effect of turbulence on the wind-direction ramps, they are under-estimated; but WRF predicts well large scale effects such as low and high pressure systems, leading to a more realistic prediction of these ramps on these time/length scales.

A new question to study and discuss here is whether the applied CNR threshold value has effect of on the ramp-events.